TOPIC: 293004
KNOWLEDGE: K1.04 [2.5/2.6]
QID: B76

Refer to the drawing of a steam-jet air ejector (see figure below) in normal operation with supersonic steam velocities.

At which of the following locations is the lowest pressure experienced?

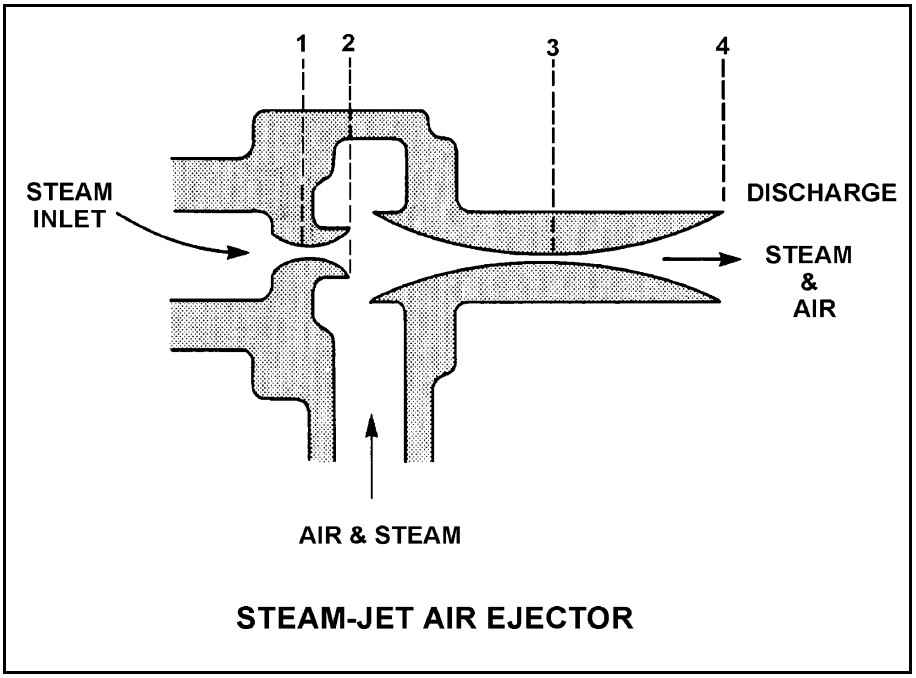
A. 1

B. 2

C. 3

D. 4

ANSWER: B.



TOPIC: 293004
KNOWLEDGE: K1.04 [2.5/2.6]
QID: B376

Refer to the drawing of a steam-jet air ejector (see figure below) in normal operation with supersonic steam velocities.

Steam flowing from D to E undergoes a pressure _____ and a velocity _____.

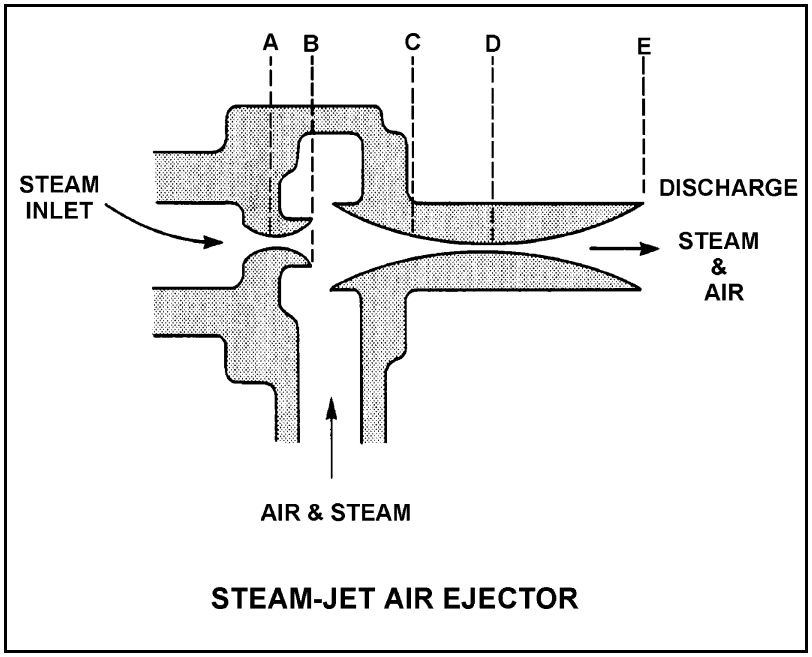
A. decrease; decrease

B. decrease; increase

C. increase; increase

D. increase; decrease

ANSWER: D.



TOPIC: 293004
KNOWLEDGE: K1.04 [2.5/2.6]
QID: B476

Refer to the drawing of a steam-jet air ejector (see figure below) in normal operation.

The section of the air ejector that converts steam pressure into kinetic energy is called the...

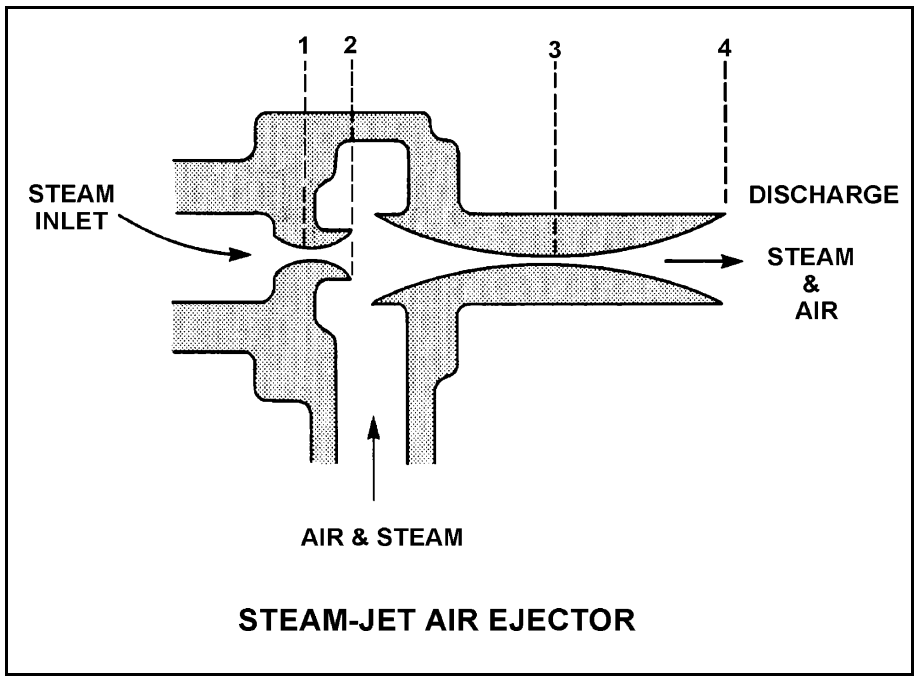
A. diffuser.

B. nozzle.

C. intercondenser.

D. riser.

ANSWER: B.



TOPIC: 293004
KNOWLEDGE: K1.04 [2.5/2.6]
QID: B1276

The steam inlet nozzles used in steam jet air ejectors convert the _____ of the steam into _____.

A. kinetic energy; pressure

B. enthalpy; kinetic energy

C. kinetic energy; velocity

D. enthalpy; pressure

ANSWER: B.

TOPIC: 293004
KNOWLEDGE: K1.04 [2.5/2.6]
QID: B1476

Steam entering an air ejector reaches sonic velocity in the throat of a convergent-divergent nozzle. Upon entering the divergent section of the nozzle, steam velocity will _____ and steam pressure will _____.

A. increase; increase

B. increase; decrease

C. decrease; increase

D. decrease; decrease

ANSWER: B.

TOPIC: 293004
KNOWLEDGE: K1.04 [2.5/2.6]
QID: B1775

Refer to the drawing of a steam-jet air ejector (see figure below) in normal operation with supersonic steam velocities.

Steam flowing from 1 to 2 undergoes a pressure _____ and a velocity _____.

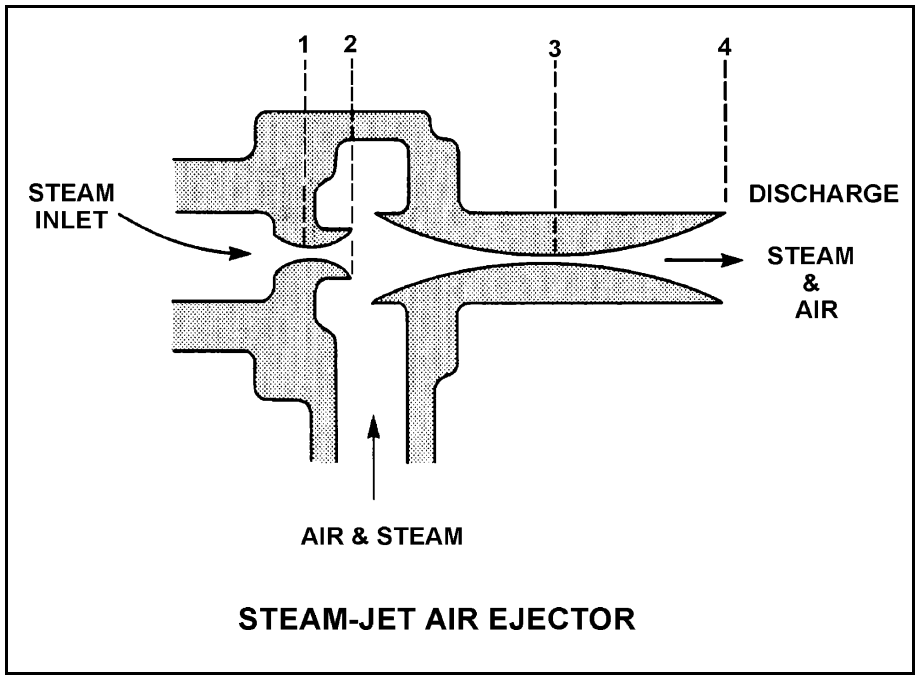
A. increase; decrease

B. increase; increase

C. decrease; decrease

D. decrease; increase

ANSWER: D.



TOPIC: 293004
KNOWLEDGE: K1.04 [2.5/2.6]
QID: B3476

Refer to the drawing of a steam-jet air ejector (see figure below) in normal operation with supersonic steam velocities.

Steam flowing from C to D undergoes a pressure _____ and a velocity _____.

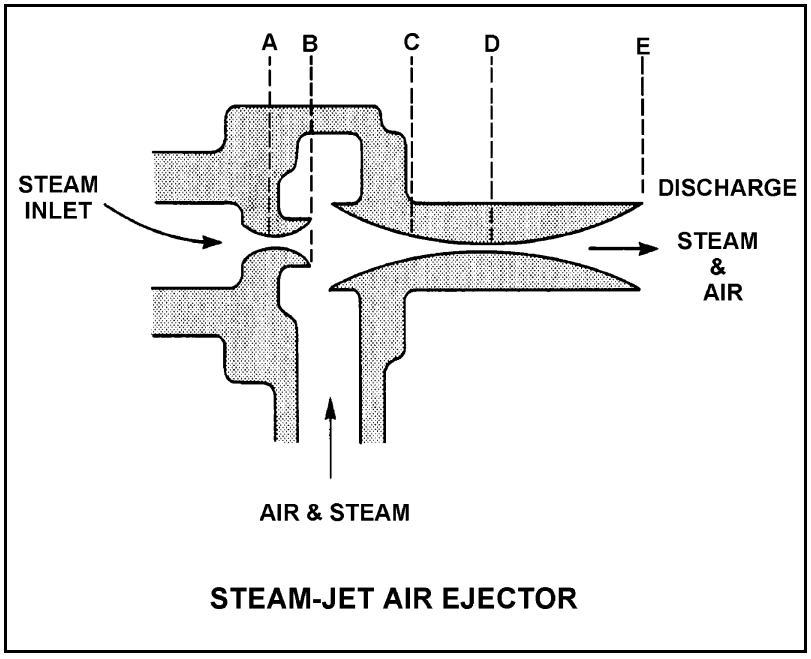
A. decrease; decrease

B. decrease; increase

C. increase; increase

D. increase; decrease

ANSWER: D.



STEAM-JET AIR EJECTOR

TOPIC: 293004
KNOWLEDGE: K1.05 [2.7/2.7]
QID: B276

During jet pump operation, high pressure and low velocity fluid flow is supplied through a _____ where the pressure drops and the velocity increases, creating a low pressure area in the _____ section.

A. nozzle; throat

B. nozzle; diffuser

C. diffuser; throat

D. diffuser; nozzle

ANSWER: A.

TOPIC: 293004
KNOWLEDGE: K1.05 [2.7/2.7]
QID: B1076

The lowest pressure in a liquid jet pump exists in the...

A. throat.

B. diffuser.

C. rams head.

D. impeller eye.

ANSWER: A.

TOPIC: 293004
KNOWLEDGE: K1.11 [2.4/2.5]
QID: P876 (B1976)*

Which one of the following is the approximate amount of condensate subcooling in a condenser operating at 26 inches Hg vacuum with a condensate temperature of 100°F?

A. 2°F

B. 19°F

C. 26°F

D. 53°F

ANSWER: C.

TOPIC: 293004
KNOWLEDGE: K1.11 [2.4/2.5]
QID: P3576 (B1484)

A main condenser is operating at 28 inches of Hg vacuum with a condensate outlet temperature of 92°F. Which one of the following is the approximate amount of condensate depression?

A. 6°F

B. 10°F

C. 13°F

D. 17°F

ANSWER: B.

TOPIC: 293004
KNOWLEDGE: K1.12 [2.9/3.1]
QID: B77

Condensate depression (subcooling) is increased by increasing...

A. main turbine load.

B. the circulating water temperature.

C. circulating water flow through the condenser.

D. air leakage into the condenser.

ANSWER: C.

TOPIC: 293004
KNOWLEDGE: K1.12 [2.9/3.1]
QID: B277 (P477)

Main condenser pressure is 1.0 psia. During the cooling process in the condenser, the temperature of the low pressure turbine exhaust decreases to 100°F, at which time it is a...

A. saturated liquid.

B. saturated vapor.

C. subcooled liquid.

D. superheated vapor.

ANSWER: C.

TOPIC: 293004
KNOWLEDGE: K1.12 [2.9/3.1]
QID: B78 (P2276)

The thermodynamic cycle efficiency of a nuclear power plant can be increased by...

A. decreasing power from 100% to 25%.

B. removing a high-pressure feed water heater from service.

C. lowering condenser vacuum from 29 inches to 25 inches.

D. decreasing the amount of condensate depression (subcooling).

ANSWER: D.

TOPIC: 293004
KNOWLEDGE: K1.12 [2.9/3.1]
QID: B200

Which one of the following effects will an <u>increase</u> in main condenser vacuum (lower absolute pressure) have on a plant? (Assume reactor power, main steam flow, and condenser circulating water flow rate are unchanged.)

A. Increase in condensate temperature

B. Increase in the amount of noncondensable gas in the condenser

C. Increase in main turbine efficiency

D. Increase in condensate subcooling

ANSWER: C.

TOPIC: 293004
KNOWLEDGE: K1.12 [2.9/3.1]
QID: B1876 (P876)

Which one of the following is the approximate condensate subcooling in a condenser operating at 26 inches Hg vacuum with a condensate temperature of 100°F?

A. 2°F

B. 19°F

C. 26°F

D. 53°F

ANSWER: C.

TOPIC: 293004
KNOWLEDGE: K1.12 [2.9/3.1]
QID: B2077 (P2476)

A plant is operating at 90% of rated power. Main condenser pressure is 1.69 psia and hotwell condensate temperature is 120°F.

Which one of the following describes the effect of a 5% decrease in cooling water flow rate through the main condenser?

A. Overall steam cycle efficiency will increase because the work output of the turbine will increase.

B. Overall steam cycle efficiency will increase because condensate depression will decrease.

C. Overall steam cycle efficiency will decrease because the work output of the turbine will decrease.

D. Overall steam cycle efficiency will decrease because condensate depression will increase.

ANSWER: C.

TOPIC: 293004
KNOWLEDGE: K1.12 [2.9/3.1]
QID: B2176 (P1176)

A nuclear power plant is operating at 80% of rated power with 5°F of condensate depression in the main condenser. If the condensate depression increases to 10°F, plant efficiency will _____ and the probability of condensate pump cavitation will _____.

A. increase; increase

B. increase; decrease

C. decrease; increase

D. decrease; decrease

ANSWER: D.

TOPIC: 293004
KNOWLEDGE: K1.12 [2.9/3.1]
QID: B2277

Condensate depression is the process of...

A. removing condensate from turbine exhaust steam.

B. spraying condensate into turbine exhaust steam.

C. heating turbine exhaust steam above its saturation temperature.

D. cooling turbine exhaust steam below its saturation temperature.

ANSWER: D.

TOPIC: 293004
KNOWLEDGE: K1.12 [2.9/3.1]
QID: B2576 (P2576)

A plant is operating at 80% power with 5°F of condensate depression in the main condenser. If the condensate depression decreases to 2°F, plant thermal efficiency will _____ and the probability of condensate pump cavitation will _____.

A. increase; increase

B. increase; decrease

C. decrease; increase

D. decrease; decrease

ANSWER: A.

TOPIC: 293004
KNOWLEDGE: K1.12 [2.9/3.1]
QID: B2676 (P576)

Which one of the following explains why condensate subcooling is necessary in a plant steam cycle?

A. To provide a better condenser vacuum

B. To maximize overall steam cycle thermal efficiency

C. To provide net positive suction head for the condensate pumps

D. To minimize turbine blade and condenser tube erosion by entrained moisture

ANSWER: C.

TOPIC: 293004
KNOWLEDGE: K1.12 [2.9/3.1]
QID: B2775 (P1977)

Condensate is collecting in a main condenser hotwell at 90°F with a condenser pressure of 28 inches Hg vacuum. Which one of the following will improve steam cycle efficiency?

A. Main condenser cooling water flow rate decreases by 5% with no change in condenser vacuum.

B. Main condenser cooling water inlet temperature decreases by 10°F with no change in condenser vacuum.

C. Main condenser vacuum decreases to 27 inches Hg due to buildup of noncondensible gases.

D. Steam flow through the turbine decreases by 10% with no change in condenser vacuum.

ANSWER: A.

TOPIC: 293004
KNOWLEDGE: K1.12 [2.9/3.1]
QID: B2976 (P1576)

What is the approximate condensate depression in a condenser operating at 28 inches Hg vacuum with a condensate temperature of 100°F?

A. Less than 2°F

B. 3°F to 5°F

C. 6°F to 8°F

D. 9°F to 11°F

ANSWER: A.

TOPIC: 293004
KNOWLEDGE: K1.12 [2.9/3.1]
QID: B3877 (P3876)

Main turbine exhaust enters a main condenser and condenses at 126°F. The condensate is cooled to 100°F before entering the main condenser hotwell. Assuming main condenser vacuum does not change, which one of the following would improve the thermodynamic efficiency of the steam cycle?

A. Increase condenser cooling water flow rate by 5%.

B. Decrease condenser cooling water flow rate by 5%.

C. Increase main condenser hotwell level by 5%.

D. Decrease main condenser hotwell level by 5%.

ANSWER: B.

TOPIC: 293004
KNOWLEDGE: K1.13 [2.5/2.6]
QID: B377

A plant is operating at 100% power when the only in-service steam jet air ejector is inadvertently isolated from the main condenser. The operator verifies circulating water system parameters have not changed. If no operator action is taken over the next 60 minutes, condenser vacuum will...

A. slowly increase (lower absolute pressure).

B. slowly decrease and stabilize at a slightly lower vacuum (higher absolute pressure).

C. slowly and continuously decrease (higher absolute pressure) towards atmospheric pressure.

D. remain essentially the same (constant absolute pressure).

ANSWER: C.

TOPIC: 293004
KNOWLEDGE: K1.13 [2.5/2.6]
QID: B877

Which one of the following explains why condensation of the steam entering a main condenser creates a vacuum?

A. The entropy of the steam increases.

B. The entropy of the steam decreases.

C. The specific volume of the steam increases.

D. The specific volume of the steam decreases.

ANSWER: D.

TOPIC: 293004
KNOWLEDGE: K1.13 [2.5/2.6]
QID: B977

A power plant is operating at 90% of rated power. Which one of the following describes the effect of increasing circulating water flow rate through the main condenser?

A. The saturation temperature in the main condenser decreases.

B. The enthalpy of the condensate leaving the main condenser increases.

C. The temperature of the circulating water leaving the main condenser increases.

D. The total rate of heat transfer from the turbine exhaust steam to the circulating water decreases.

ANSWER: A.

TOPIC: 293004
KNOWLEDGE: K1.13 [2.5/2.6]
QID: B1177

A plant is operating at 100% power. Which one of the following describes how and why main condenser pressure changes when condenser cooling water flow rate significantly decreases?

A. Decreases because main condenser saturation temperature increases

B. Decreases because main condenser condensate subcooling decreases

C. Increases because main condenser saturation temperature increases

D. Increases because main condenser condensate subcooling decreases

ANSWER: C.

TOPIC: 293004
KNOWLEDGE: K1.13 [2.5/2.6]
QID: B2377

A plant is operating at 100% power. Which one of the following describes how and why main condenser pressure changes when condenser cooling water flow rate increases significantly?

A. Decreases because main condenser saturation (shell) temperature decreases

B. Decreases because main condenser condensate subcooling increases

C. Increases because main condenser saturation (shell) temperature decreases

D. Increases because main condenser condensate subcooling increases

ANSWER: A.

TOPIC: 293004
KNOWLEDGE: K1.14 [2.6/2.7]
QID: B577

During normal plant operation at full power, the operating pressure in the main condenser is directly affected by the: (Assume each parameter remains within its normal operating range.)

A. amount of condensate subcooling.

B. level of the condensate in the hotwell.

C. temperature of the circulating water.

D. quality of the steam entering the high pressure turbine.

ANSWER: C.

TOPIC: 293004
KNOWLEDGE: K1.14 [2.6/2.7]
QID: B1677

Which one of the following is a primary function performed by a main condenser?

A. Deaerate turbine exhaust condensate

B. Remove ions from main condensate

C. Filter out impurities from main condensate

D. Provide net positive suction head for feed water pumps

ANSWER: A.

TOPIC: 293004
KNOWLEDGE: K1.14 [2.6/2.7]
QID: B1777

A plant is operating normally at 80% power. Which one of the following will result in the most rapid initial loss of condenser vacuum?

A. All air ejectors are isolated from the main condenser.

B. All feed and condensate pumps are stopped.

C. All condenser cooling water flow is stopped.

D. All condenser hotwell makeup water flow is stopped.

ANSWER: C.

TOPIC: 293004
KNOWLEDGE: K1.14 [2.6/2.7]
QID: B3077 (P3078)

Which one of the following will be caused by a decrease in main condenser vacuum (higher absolute pressure) on a plant operating at full power? (Assume main steam flow rate and condenser circulating water flow rate are unchanged.)

A. Decrease in the condensate temperature

B. Decrease in the ideal steam cycle efficiency

C. Decrease in the condensate pump required NPSH

D. Decrease in the mass of noncondensable gas in the condenser

ANSWER: B.

TOPIC: 293004
KNOWLEDGE: K1.14 [2.6/2.7]
QID: B3777 (P3734)

A nuclear power plant is operating near rated power with the following initial conditions:

Main steam pressure: 900 psia
Main steam quality: 100%, saturated vapor
Main condenser pressure: 1.0 psia

Air leakage into the main condenser results in the main condenser pressure increasing and stabilizing at 2.0 psia. Assume that all main steam parameters (e.g., pressure, quality, and mass flow rate) remain the same and that the main turbine efficiency remains at 100%.

Which one of the following is the approximate percent by which the main generator output will decrease as a result of the main condenser pressure increase?

A. 5.0%

B. 6.3%

C. 7.5%

D. 8.8%

ANSWER: C.